

# Low Decibel Power Infrasound in Divine Sound Meditation

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**Abstract:** *This research work is an attempt to scientifically interpret the meditative chant called the Divine Omdasji sound meditation (SR0000398348 dated 2006-09-13, United States Copyright Office) – hereafter referred to in this manuscript as Divine Sound -- renowned to bring peace and calm to the meditating human subject. It is the outcome of inspiration dawned on the authors to scientifically investigate such phenomena connected with Divine Sound Meditation. The Divine Sound has been found to have many properties that science can explain. Spectral Analysis of the Divine Sound was performed using Signal Processing techniques. The results indicated presence of low decibel power infrasound in the Divine Sound. This paper proposes interpretations to this and other characteristics inferred from the experimental results arising out of scientific analysis on the Divine Sound.*

**Index Terms:** *Divine Sound, Meditation, Peace, Calm, Infrasound, Spectral Analysis*

## I.INTRODUCTION

Meditation is a mental activity associated with attaining a deeply restful yet fully alert state [1] and is characterized by the attainment of a restful yet fully alert physical and mental state practiced by many as a self-regulatory approach to emotion management [2]. Meditation is labeled as “A wakeful Hypometabolic Physiologic State” [3]. The idea of a body–mind connection is not a new one. In fact, it is only in our recent past that the two ideas have been seen as separate [4]. Physiological alterations in the human subjects led to the attention of many researchers and journals to concentrate on Meditation, and its effect on the human subject was assessed in various ways.

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A series of research articles have been published on Meditation [5 - 9]. The Divine Omdasji sound meditation (SR0000398348 dated 2006-09-13, United States Copyright Office), a meditative chant sung by Dhyanyogi Omdasji is renowned to cause a lot of beneficial physiological effects to the meditating human subject. This research work concentrates on the low decibel power infrasound present in the Divine Sound. The following discussion introduces Meditation and provides the bridge knowledge between Meditation and Science, further elaborating on the scientific investigations carried out in this research work and the interpretation of the results thus obtained.

## II.MEDITATION, CONSCIOUSNESS AND MUSIC

Meditation is an ancient spiritual practice that has recently been studied due to its potential health promoting effects, and its status as a special form of consciousness, different from ordinary waking and sleep. The recent decades have witnessed a marked change in the perspective of viewing Meditation as a solely mystic process of spiritual quest to a complementary effective method in several health situations [10].

In a survey of the EEG characteristics of persons practising Meditation, the theta bursts were preceded and followed by alpha rhythm. Subject reports elicited during theta bursts indicated pleasant states with intact situational orientation and no subjective experiences related to sleep. It is hypothesized that theta burst may be the manifestation of a state adjustment mechanism which comes into play during prolonged low-arousal states, and which may be related to EEG patterns of relaxation in certain behavioural conditions [11].

Changes in EEG coherence patterns were used to test a field model that posits a common field of "pure consciousness" linking all individuals. The experimental data support a field model of consciousness [12]. While a considerable number of studies have been carried out with EEG, only few studies have used PET and fMRI [9, 13]. Consciousness is a subtle phenomenon, which has so far resisted all attempts to understand it, in spite of the

present 'race for consciousness' [14]. It has been debated in many areas, including brain sciences [15].

Meditation is defined as an exercise [16], which usually involves training the individual to focus the attention or consciousness in a single object, sound, concept or experience. The human being is thought of as a musical instrument.

By changing the patterns and rhythms of sound and breath, it is possible to link all the systems of the body that regulate excitement, relaxation, action, reaction and intelligence. In basic meditation, only a small area of the brain was engaged while the addition of selected sounds in Medical Meditation produced more pronounced levels of activation [17]. This research work concentrates on Meditation using Music (Divine Sound) as attentive input.

### III.Scientific Investigations on the Source of Experience – Divine Sound

Modern psychology has the tools to explain the nature of the experience, and this leads one to believe that it can explain the source of the experience [18]. Hence, the Divine Sound was chosen for scientific experimentation since it is renowned to be a source of Meditative Experience. Divine Sound is a series of Sanskrit vowels, consonants and words sung by Dhyanyogi Omdasji.

An electronic drone is used to provide a monophonic effect or accompaniment to the chant of the Divine Sound. While chanting the Divine Sound, a series of words and notes issues forth from Dhyanyogi Omdasji. His singing is renowned to have a physiological effect on the listeners, often attributed to his lifelong intense yogic practices.

The physiological effects are known to manifest as calmness of the mind, easy entry into meditative states (characterized by low frequency EEG waves) accompanied with or without meditative experiences, cure for insomnia, quitting smoking habits, healing & emotional stability.

Another view that is attributed by people to the Divine Sound is that the Divine Sound yield peace to the client, and could also purify the thought processes leading to possibly reduced crime rate in society.

The Divine Sound is also renowned to awaken the Kundalini Power which is the goal of many spiritual practices. The Divine Sound has been internationally recognized. Two instances of international recognition include the Certificate of Honor given by the Board of Supervisors of the City and County of San Francisco International Journal of BioSciences and Technology (2008), Volume 1, Issue 1, Page(s): 1-9

and the Proclamation of the Mayor on behalf of the City and County of San Francisco declaring September 9, 2006 as Divine Yogi Dhyanyogi Omdasji Day in San Francisco. The aim of this and further research is to investigate the source of the experience so that more scientific interpretation can be given.

To avoid disturbances due to ambient noise or other sources of sound, a professional studio recording was preferred. Therefore, a professional studio recording of the Divine Sound chant was obtained and used for further scientific investigations.

### IV.EXPERIMENTS

The configuration of the computer used for analysis was a Pentium IV 2.66 GHz with 512 MB RAM running on Microsoft Windows XP Media Center Edition Version 2002 with Service Pack 2.

The software used for analysis was MATLAB 7.0.0 (R14). After analysis of the computational resources available and assuming that analysis of audio range up to 4 KHz was sufficient for human voice analysis, the Nyquist criteria yielded 8 KHz sampling rate.

Since the professional studio recording was a stereo recording, it was recorded as 8 KHz 16 bit stereo audio file for duration spells of ten minutes each.

The odd labeled files recorded the first ten minutes of each quarter of the hour, and the even labeled files recorded the last ten minutes of each quarter of the hour, yielding 8 unique ten minute recordings at 8 KHz 16 bit stereo for the entire Divine Sound Chant approximating an hour. In the stereo recordings, the first channel data was obtained using MATLAB software and used for further analysis.

In this research work, the first ten minute recording has been scientifically analyzed. Since the audio data was recorded at 8 KHz sampling rate, a 600 second recording yielded  $4.8 \times 10^6$  data points. Figure 1 displays the original audio recording of the first 600 seconds of the Divine Sound chant as an amplitude-time graph.

The amplitude for each second was obtained by taking the mean of the 8000 sample points for each second. The X- axis denotes the time in seconds and Y-axis denotes the mean amplitude in Volts or better expressed as milliVolts. It is found that a majority of data points lie in the 14 mV to 16mV range.

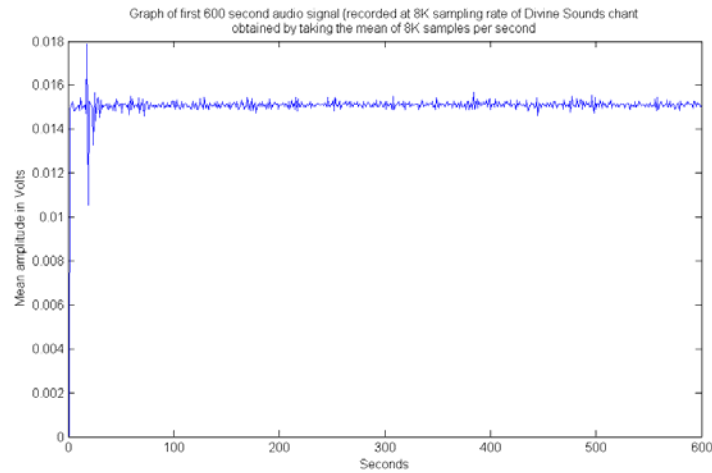


Fig.1 Graph of original audio recording of the first 600 seconds of Channel 1 of the Divine Sound chant

Figure 1 shows the graph of the original audio recording of the first 600 seconds (ten minutes) of Channel 1 of the Divine Sound chant. The audio recording had been performed on MATLAB software at 8 KHz 16 bit stereo, and the digital samples were obtained. This implies that 8000 data points (indicating amplitude) would represent every second of the Divine Sound Chant. To construct the graph of the original audio signal, each 8000 data points was averaged for every second and the mean amplitudes were indicated against time, to obtain a time domain graph of the original audio recording.

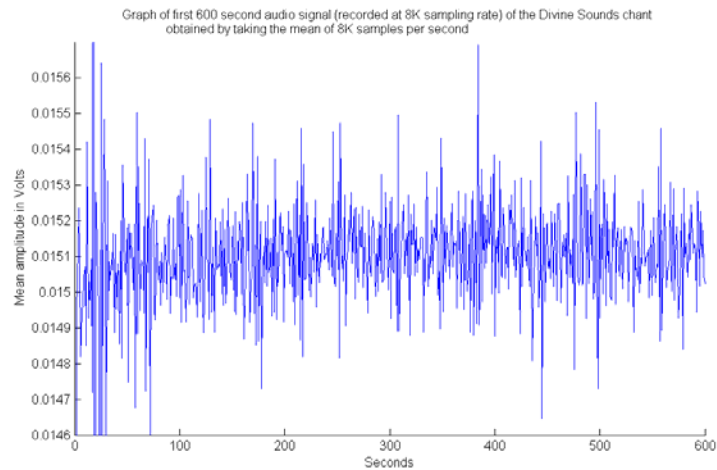


Fig.2 Zoomed Graph of original audio recording of the first 600 seconds of Channel 1 of the Divine Sound chant

Figure 2 shows a Zoomed Graph of Figure 1. This has been done by viewing the graph between Y axis limits of 14.6 mV to 15.6mV using MATLAB software. Figure 2 thus yields a better view of the original audio signal of the Divine Sound chant corresponding to Channel 1 of the first 600 seconds.

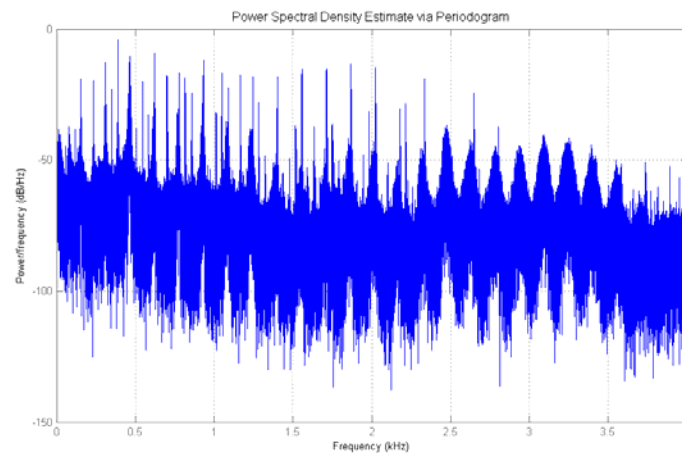


Fig. 3 Periodogram of first ten minute recording of Divine Sound

Fig 3. Shows periodogram of the first ten minute recording of Divine Sound computed using Matlab

To perform a detailed study of the graph, Figure 1 was zoomed. Figure 2 shows a zoomed portion containing majority of the graph points of Figure 1.

Thus the Divine Sound chant was obtained in a form that could be scientifically investigated. Then, attention was focused on the methodology to be chosen for investigating the Divine Sound chant data.

One of the major effects known to be caused by the Divine Sound is the alteration of EEG waves towards low frequency rhythms. The reason may be attributed to changes of electrical activity of the brain produced by auditory stimuli [19].

Perhaps, the alteration of brain waves to low frequency rhythms and hence transition among the rhythms could be attributed to the phenomena of phase-locking. Phase-locking plays a dominant role in the neural encoding of the spectrum of speech sounds [20].

This suggests that all these phenomena experienced by the subject could have been transferred from the Divine Sound. Hence, spectral analysis of the Divine Sound was carried out.

## V.RESULTS

The goal of spectral estimation is to describe the distribution (over frequency) of the power contained in a signal, based on a finite set of data. Estimation of power spectra is useful in a variety of applications, including the detection of signals buried in wide-band noise (MATLAB Signal Processing Toolbox Helpdesk available at [www.mathworks.com](http://www.mathworks.com)).

Spectral Analysis of the Divine Sound was carried out using MATLAB 7.0.0 (R14) software on a Pentium IV 2.66 GHz computer with 512 MB RAM running on Microsoft Windows XP Media Center Edition Version 2002 with Service Pack 2.

Periodogram of the first ten minute recording of Divine Sound was computed using Matlab and shown in Fig. 3. The periodogram plot showed frequencies in the range up to 4 KHz (maximum range set for this investigation).

Of particular interest were the frequencies corresponding to the various EEG bands, especially the delta and theta EEG bands (for reasons discussed in the forthcoming paragraphs).

The EEG bands were chosen to be the following ranges.

Delta: Greater than or equal to 0.1 Hz to less than 4 Hz

Theta: Greater than or equal to 4 Hz to less than 8 Hz

Alpha: Greater than or equal to 8 Hz to less than 14 Hz

Beta: Greater than or equal to 14 Hz to less than 30 Hz

The recorded Divine Sound audio was investigated for the presence of frequencies corresponding to the various frequency bands in the EEG rhythms. At the conventional range of -40 db from the maximum signal power, a few frequencies were observed in the alpha & beta ranges and the frequencies were plotted against power (in db) shown in Figures 4 & 5. All negative db level references henceforth will mean negative db level thresholds calculated from the maximum signal power.

It is known that the actual signal power reduces drastically with decrease in db levels. Since the Divine Sound audio signal is investigated for frequencies equivalent to very low frequency EEG rhythms less than 8 Hz (equivalent audio range falls in inaudible ranges), the authors investigated for frequencies corresponding to power levels which are very much less than the conventional -40 db range, hoping to find more information.

The power of the audio signal was not a strict constraint when investigating inaudible frequency ranges. The low power of the inaudible signal is not a major factor of merit as the signal is already inaudible.

Therefore, the inaudible frequency ranges (corresponding to equivalent very low frequency EEG rhythms) from the Periodogram of the first ten minute recording of the Divine Sound audio signal were investigated at very low power ranges of -60 db, -80 db and -100 db (from the maximum signal power).

Spectral analysis of the Divine Sound yielded Figures 4 to 17 showing stem plot of the frequencies that are observed in the respective threshold region (from maximum signal power) in the Divine Sound recording of the first ten minutes.

The Graph is plotted with frequency on the X-axis and Power in db on the Y-axis. The cyan stem indicates the presence of the particular frequency ranges and the red crosses indicate the power (in db) present in that frequency in the Divine Sound Recording of the first ten minutes.

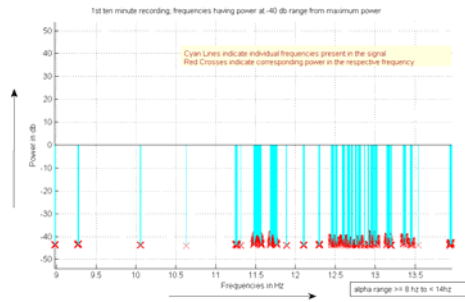


Fig. 4 Alpha Range frequencies present at -40 db threshold in the Divine Sound recording of the first ten minutes

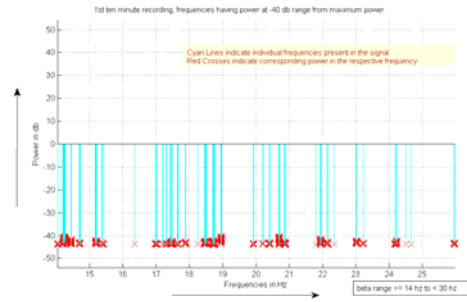


Fig. 5 Beta Range frequencies present at -40 db threshold in the Divine Sound recording of the first ten minutes

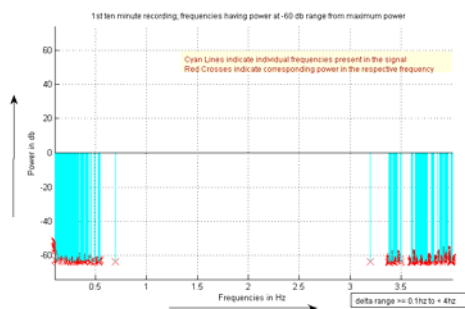


Fig. 6 Delta Range frequencies present at -60 db threshold in the Divine Sound recording of the first ten minutes

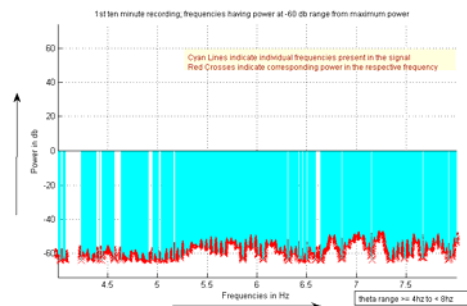


Fig. 7 Theta Range frequencies present at -60 db threshold in the Divine Sound recording of the first ten minutes

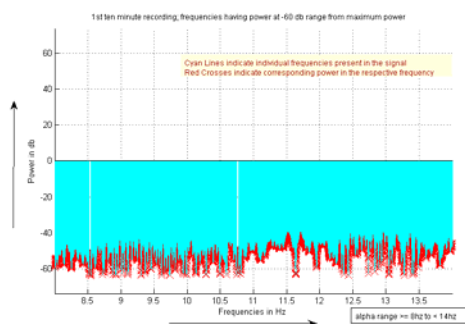


Fig. 8 Alpha Range frequencies present at -60 db threshold in the Divine Sound recording of the first ten minutes

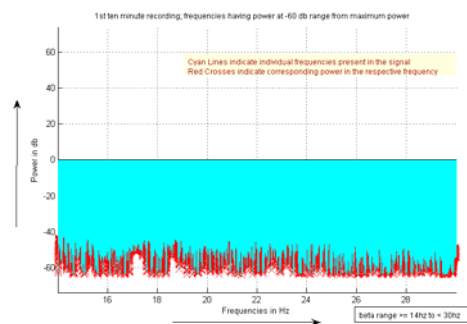


Fig. 9 Beta Range frequencies present at -60 db threshold in the Divine Sound recording of the first ten minutes

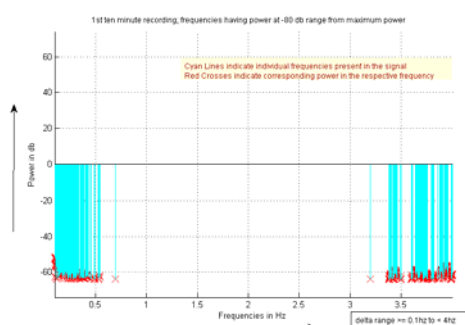


Fig. 10 Delta Range frequencies present at -80 db threshold in the Divine Sound recording of the first ten minutes

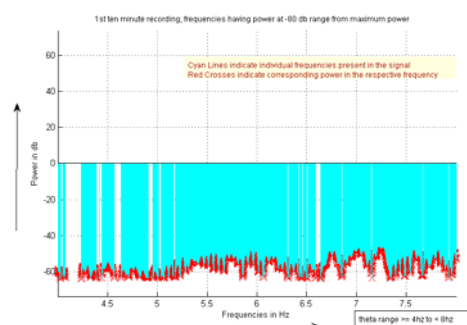


Fig. 11 Theta Range frequencies present at -80 db threshold in the Divine Sound recording of the first ten minutes

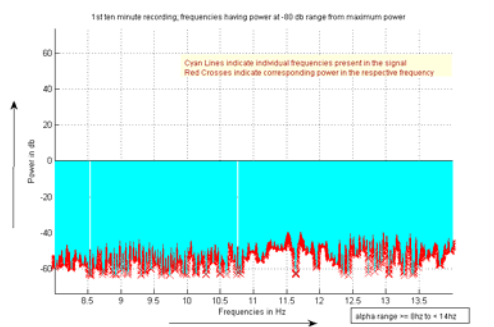


Fig. 12 Alpha Range frequencies present at -80 db threshold in the Divine Sound recording of the first ten minutes

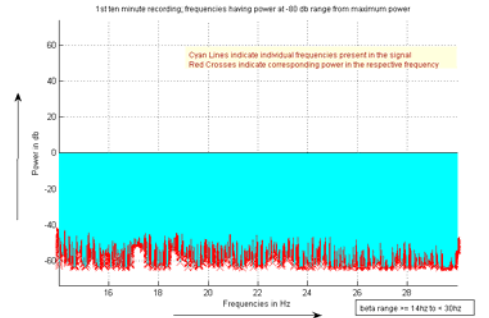


Fig. 13 Beta Range frequencies present at -80 db threshold in the Divine Sound recording of the first ten minutes

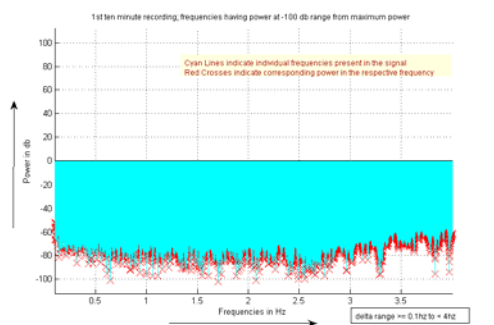


Fig. 14 Delta Range frequencies present at -100 db threshold in the Divine Sound recording of the first ten minutes

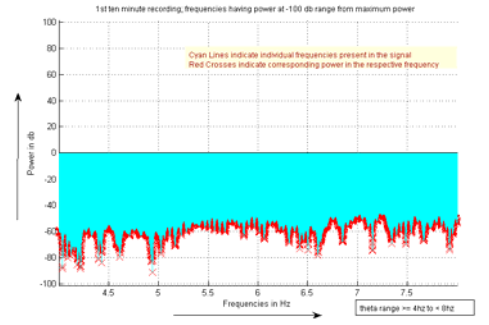


Fig. 15 Theta Range frequencies present at -100 db threshold in the Divine Sound recording of the first ten minutes

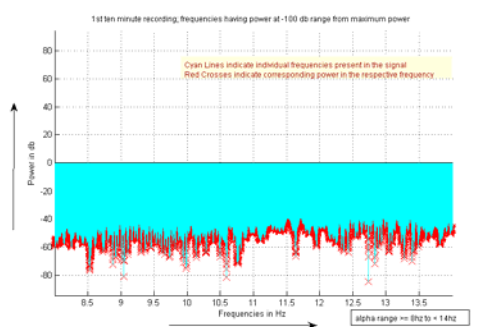


Fig. 16 Alpha Range frequencies present at -100 db threshold in the Divine Sound recording of the first ten minutes

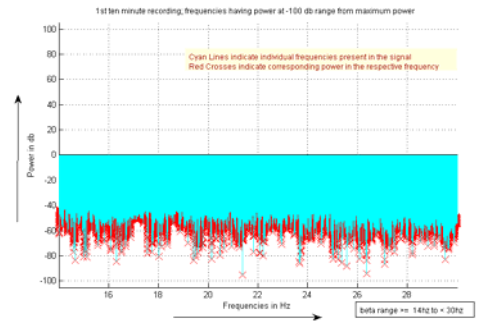


Fig. 17 Beta Range frequencies present at -100 db threshold in the Divine Sound recording of the first ten minutes

Figures 4 to 17 show the frequencies present in the Periodogram of the first ten minute recording of the Divine Sound audio signal. This implies that these frequencies indicated in Figures 4 to 17 are present in the Divine Sound audio signal. Therefore, the presence of very low frequency ranges (corresponding to very low frequency EEG rhythms) in the Divine Sound audio signal have thus been established.

## VI. INFERENCES

Careful observation of Figures 4 to 17 conveyed the following information.

**Delta:** Greater than or equal to 0.1 Hz to less than 4 Hz

1. Absent in the -40 db level threshold

2. Present in the -60 db, -80 db & -100 db level thresholds
3. Clusters of frequency components observed below 1Hz and above 3Hz in the Delta Range at -60 db and -80 db level thresholds
4. The entire Delta range of frequencies seem to be present in the -100 db level threshold indicating presence of the complete band of Delta range of frequencies.

**Theta: Greater than or equal to 4 Hz to less than 8 Hz**

1. Absent in the -40 db level threshold
2. Present in the -60 db, -80 db & -100 db level thresholds
3. Clusters of frequencies observed with non-periodic absence of frequencies within the theta range in both the -60 db and -80 db level thresholds
4. The entire Theta range of frequencies seem to be present in the -100 db level threshold indicating presence of the complete band of Alpha range of frequencies.

**Alpha: Greater than or equal to 8 Hz to less than 14 Hz**

1. Present in the -40 db, -60 db, -80 db and -100 db thresholds
2. In the -40 db level, frequencies are sparsely present with predominant non-periodic absence of frequencies manifested.
3. Majority of frequencies are present in -60 db & -80 db thresholds, with occasional non-periodic absence of some frequencies.
4. The entire Alpha range of frequencies seem to be present in the -100 db level threshold indicating presence of the complete band of Alpha range of frequencies.

**Beta: Greater than or equal to 14 Hz to less than 30 Hz**

1. Present in the -40 db, -60 db, -80 db and -100 db thresholds
2. In the -40 db level, minority presence of frequencies is observed with major gaps caused by absence of frequencies.
3. The entire Beta range of frequencies seem to be present in the -60 db, -80 db and -100 db level thresholds indicating presence of the complete band of Beta range of frequencies.

## VII.DISCUSSION

The scope of this research work is restricted to establishment of the following:

1. Presence of audio frequencies corresponding to EEG rhythms.
2. Interpretation of the relationship between the presence of audio frequencies corresponding to EEG rhythms and the human subjects' alteration in their EEG brain waves.
3. Interpretation of the phenomena of the guidance exhibited by the Divine Sound to the human subjects' EEG brain waves alterations.
4. Safe Infrasound Power levels in the Divine Sound.

**1. Presence of audio frequencies corresponding to EEG rhythms.**

The observations (discussed in the previous paragraphs) have thus established the presence of audio frequencies corresponding to the various EEG rhythms.

**2. Interpretation of the relationship between the presence of audio frequencies corresponding to EEG rhythms and the human subjects' alteration in their EEG brain waves.**

It is conventionally known that human subjects experience alteration in various biophysical responses including EEG rhythms on listening to the Divine Sound. The scope of this research work is related to EEG rhythms and hence the discussion restricts to EEG rhythms only.

It is a renowned fact that the EEG rhythms of inexperienced meditators can shift between alpha and beta states, while those of the experienced meditators can shift between any of the four states of delta, theta, alpha & beta. In the observations of the Divine Sound, it is found that frequencies are present in the alpha and beta ranges at a comparatively higher power level of -40 db (from maximum power level), whereas at lower power levels of -60 db and -80 db the frequencies are present as majority accompanied with absence of some frequencies. The -100 db level is characterized by the presence of frequencies over the entire band completely. This agrees with the conventional wisdom that inexperienced meditators will be able to resonate to meditative guidances at alpha and beta EEG states, while the more experienced meditators will be able to absorb and resonate to the more subtle (lower power) delta and theta EEG states in addition to the alpha and beta EEG states. This absorption of meditative guidance and resonance of the human subjects to the Divine Sound could be explained as

phenomena similar to auditory evoked potentials or auditory steady state responses (though the phenomena are not exactly the same).

### 3. Interpretation Hypothesis of the phenomena of the guidance exhibited by the Divine Sound to the human subjects' EEG brain waves alterations.

The discussions under the previous two subheadings have explained the presence of audio frequencies in the Divine Sound corresponding to human EEG brain waves and the relationship between the Divine Sound and alteration in the human subjects' EEG brain waves. It is found that except portions of the beta range, the other ranges of delta, theta and alpha fall in the inaudible range of audio frequencies and the Divine Sound is an auditory meditative guidance phenomena. The medium of guidance or resonance can be explained using the concept of biophotons and their communication [21].

A summary of the above discussion sheds light on the fact that the Divine Sound exhibit a meditative guidance leading the human subjects' EEG brain waves into low and very low frequency rhythms possibly through the concept of biophoton communication, similar to auditory evoked potentials or auditory steady state responses; the only difference being that the frequency ranges of interest fall in the inaudible levels for human beings, called Infrasound.

### 4. Safe Infrasound Power levels in the Divine Sound

The earlier discussions establish the presence of infrasound in the Divine Sound. But there has been widespread apprehensions and anxiety about infrasound. Infrasound is acoustic energy with frequencies up to 20 Hertz (Hz), having wavelengths of 17 m or more [22].

The American Conference of Governmental Industrial Hygienists (ACGIH) recommends that except for impulsive sound with durations of less than 2 seconds, one-third octave levels for frequencies between 1 and 80 Hz should not exceed a SPL ceiling limit of 145 dB, and the overall unweighted SPL should not exceed a SPL ceiling limit of 150 dB; no time limits are specified for these recommended levels [23]. It was concluded that short periods of continuous exposures to infrasound below 150 dB are safe and that continuous exposures up to 24 hours are safe if the levels are below 118 dB [24].

It is found that the maximum db power of the Divine Sound signal is only **-3.9807 db** and hence continuous 24 hour exposure to Divine Sound would perfectly be safe, judging by the earlier set standards [24]. Also dense spectra of infrasound is found in the -100db level (from maximum signal power) and gradually decreases until it becomes a sparse spectra in the -40 db level (from maximum signal power) accompanied with total absence of certain frequency ranges (shown in figures 8 – 19; also indicated in Table 1). The number of frequency components in each range is given in Table 1.

**Table 1. Number of Frequency Components in each frequency range**

	<b>Delta ≥ 0.1 to &lt; 4 hz</b>	<b>theta ≥ 4 to &lt; 8 hz</b>	<b>alpha ≥ 8 to &lt; 14 hz</b>	<b>beta ≥ 14 to &lt; 30 hz</b>
<b>-40db</b>	0	0	726	660
<b>-60db</b>	530	3618	6168	16140
<b>-80db</b>	530	3618	6168	16140
<b>-100db</b>	4088	4194	6292	16777

Table 1 shows the number of frequency components in each range. The sampling rate is 8K and duration of recording is 600 seconds. The db levels indicate the range between the maximum signal power and the indicated value (in db). The values in the table indicate the number of frequency components present in the signal within the given frequency ranges (in hz) and the power levels (in db). Though infrasounds lie below 20Hz, this table also indicates the beta range (14 to 30 Hz) since it is essential with regard to meditative perspectives relating to EEG frequency ranges.

The maximum signal power **-3.9807 db** lies very much within the safe margin for human exposure compared with the levels [24]. It is hence established that the Divine Sound should be safe for human physiological systems and continuous 24 hour exposure to Divine Sound as a meditative source may not affect the physiological systems because the maximum db power of the Divine Sound signal is only -3.9807 db.

It should be noted that this discussion concerns strictly with the Divine Sound signals below 30 Hz and the standards set for the infrasound by [24]. The signal power of the audible Divine Sound signals above 30 Hz has not been investigated here as it does not fall within the scope of this research work.

## VIII.CONCLUSION

This research work hence provides significant scientific interpretation and hypothesis that corroborates the conventional renowned facts about the Divine Sound, with specific reference to the points that the Divine Sound is a very good meditative guidance



that can help the human subject to achieve alteration of EEG brain waves to very low frequency rhythms, which should usher in peace and calm to the human subject. The Divine Sound infrasound db power level lies very much within the safe limits and hence the Divine Sound is expected to be very safe for human physiological systems and may be used as a good meditative guidance, even for 24 hours continuously.

## IX.ACKNOWLEDGEMENT

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